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TROPICAL AGRICULTURE is published at the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, West Indies, at the end of the third week of the month preceding the one of issue. Advertisement rates can be obtained at the College from the Editor, or from the Secretary of the College, 14, Trinity Square, London, E.C. 3, England. The Editor will be glad to consider authoritative articles for publication. It is understood that opinions expressed in signed articles are those of the author and do not necessarily represent the policy or opinion of the College Authorities. Increasing numbers of inquiries are being received from various parts of the tropics which can be answered only by persons possessed of an intimate knowledge of local conditions. Enquirers should first satisfy themselves that their local Department of Agriculture is not able to supply them with the desired information before communicating with us. Correspondence which will be replied to is invited on all other matters pertaining to tropical agriculture, science and development.

IMMIGRATION.

It is a curious feature of the economic organization of the world that the human inhabitants upon it are distributed very unevenly over its surface, much in the same way as the wealth of the world is divided in an unequal manner. According to the old, but now discredited tenet of political theory, it was assumed that, in the early days of the world, the most fertile regions were first inhabited and that the other areas became occupied only as the pressure of population rendered expansion inevitable. History informs us that the exploitation of new areas has depended more on the convenience of available facilities than upon any pre-conceived theory of fertility. It by no means follows that the existing distribution of population is the best that human ingenuity could devise, any more than the existing distribution of wealth can be justified on the grounds of social service. Indeed there can be no doubt an omnipotent being, gifted with unerring foresight and given a *carte blanche*, would effect a radical alteration in the distribution of the world's population, in order that the optimum welfare of all human beings might be secured. In reality, we never begin with a *tabula rasa*. We have merely to consider the advantages, or disadvantages, of some slight change in any particular direction. The reasons for the existing distribution are so involved that it is beyond the ingenuity of man to appreciate to the full the various factors and forces that have been at work. History, in so far as it is recorded tells us much, but by no means all. Since man cannot understand, he is content to accept facts as they are. We know that some areas are suffering because the inhabitants are so numerous that the economic instruments in their possession are incapable of providing them with the bare means of subsistence, while other areas remain in a state of stagnation because the inhabitants are minute in comparison with their potential wealth. It should be noted, however, that the mere density, relative or absolute, of population, affords no index to over-population or under-population. England, for example, was considered over-populated, and probably rightly so, at a time when she possessed but a fraction of the population considered totally inadequate at a later period. Nor does employment offer any satisfactory criterion. In spite of the appalling unemployment in England to-day, it is by no means clear that over-population exists. Unemployment may result from a temporary dislocation of the economic organization of the country in which it occurs, or of another country with which it is directly or

indirectly connected. After allowing full weight for these qualifications, it is nevertheless evident that certain parts of India, for example, would benefit by a decrease of population, and equally true that other parts of India would benefit by an increase. It is a characteristic of the Indian tea indust y, that from its introduction, it has always complained, with monotonous regularity, of the inadequacy of its labour supply. This lack of labour has not been an unmixed evil, since it has prevented periods of reckless and destructive expansion, which might have ruined the whole industry. It has certainly placed a premium upon labour-saving devices and scientific culture and manufacture and enabled the industry, in the long run, to oust its greatest rival, the Chinese tea industry, furnished with the cheapest labour in the world, from its well established position as the world's supplier of tea. Yet within a comparatively short distance of Assam there exist areas in which a single badh arvest, and certainly a succession of bad harvests, particularly before the railway era, has wrecked untold misery upon the wretched inhabitants.

History records numerous attempts, both voluntary and compulsory, before the Exodus and after, to secure for the world a more satisfactory distribution of population. These have been partly political, partly ethical, partly economic, in their nature. Such factors are strongly in evidence to-day. Other factors are at work in an opposite direction. Man is notoriously loath to leave his old associations for another sphere, even when it would be obviously to his own pecuniary benefit. In those tropical regions in which social status is measured by one's territorial possessions, man is extraordinarily averse to abandoning his dignity as a landowner, even long after the land has ceased to furnish him with adequate means of subsistence. Where primogeniture rules, and the possession of land is not regarded as a fetish, this factor plays a less important part. In Australia, national sentiment dictates (rightly or wrongly), that additional population, apart from natural increase, shall be provided by means of white settlers. The United States, with its heterogenous conglomeration of racial elements, has decided to restrict immigration to certain definite national quotas, in order that the highly paid American labourer shall not be "sweated" by the competition of the "pauper population of Europe." On the other hand, India with its extraordinary racial and religious complex, but with a growing consciousness of national prestige, had determined to direct its emigrant population into those channels considered by its intelligensia to be worthy of its reception. To those tropical regions destitute of an adequate labouring population, Africa and slavery at one time provided an inexhaustible reservoir of labourers. The cheapness of this source of labour, and the callous indifference of the slave-owners, laid the foundation for a future poverty of man power. Fortunately, those days have merged, if not into oblivion, at least into the past. Asia then came to be regarded as the overflowing well of labour. Chinese immigrants were introduced into different regions, with varying success. Eventually India became the recognized source of labour as far as the British Empire was concerned. At first the system of indenture under which these East Indian labourers were introduced was barely distinguishable from slavery. Improved means of communication and the growth of humanitarian sentiment reduced these obnoxious features to a minimum. To-day, East Indians in many parts of the British Empire occupy high and honoured posts gained by their own ability and industry.

At the present time British Guiana is sadly in need of additional population in order to transform its title of "the magnificent province" from a pious hope into reality. For many years this Colony has been entirely dependent upon a regular flow of indentured immigrants from India in order to maintain its labouring force at a magnitude consistent with the gradual development of the country. There gradually arose in India a vocal and insistent protest, stimulated by the war, against immigration in general and indentured immigration in particular, with its attendant loss of caste, national dignity and pride. Commissioners from India have, on several occasions, visited British Guiana to enquire into the existing conditions in so far as they affect the welfare of the Indian immigrant population and while their reports were, in general, extremely favourable to the Colony, opinion in India became so averse to immigration, that in 1917 the Government in India terminated the system. Opponents of the system have derived considerable political capital from the fact that an annual influx of labourers has hitherto been necessary in order to maintain the numbers of the labouring population, the implication being that the climate is so unsuitable and the conditions so harsh that the death rate has in consequence been exceedingly heavy. These biassed politicians have chosen completely to ignore the astonishing disparity between the numbers of male and female immigrants which has been directly responsible for an extraordinarily low birth rate. This has been a capital error for which British Guiana has paid and is paying dearly and it is to be hoped that if and when immigration is resumed, the responsible authorities will insist upon an adequate ratio of female immigrants. It is natural that employers of agricultural labour, should look with greater favour upon male labourers than upon female labourers, but neither the planter, nor, more particularly the Government, can afford to discount the future in this prodigal manner. Critics have, in addition, almost invariably ignored the numbers of immigrants, who have risen from the employed to the employing classes. This is obviously a matter for congratulation and one which deserves every encouragement, but it is only the carping critic who can afford to ignore the fact that the movement tends to deplete the labouring population. To these losses must be added the number of immigrants repatriated. The Government of India recently sent a delegate

Mr. Singh, M.A., C.I.E., to investigate the question of Indian immigration in Trinidad and British Guiana. It is but right that India should insist upon every reasonable assurance and investigation in a matter upon which the happiness and prosperity of thousands of her sons and daughters depend. Mr. Singh was met, both in Trinidad and British Guiana, by deputations of East Indians representing almost every class of the community and appears to have left with a very favourable impression of the possibilities of East Indians in these Colonies. We trust that the report, which he will in due course present, will lead to a solution of the problem which will be satisfactory to both countries.

THE COLONIAL BANK.

Conditions in the West Indies.

SPEAKING at the 175th half-yearly general meeting of the Colonial Bank—now henceforth to be known as Barclays Bank (Dominion, Colonial and Overseas)—Mr. C. F. Wood, the Chairman, said: In the West Indies, conditions on the whole are improving and the weather has been favourable. Unfortunately, the price of the principal export, sugar, is far from satisfactory, though this has been mitigated to some extent by a larger output. The West Indies and British Guiana produce excellent grocery (or Demerara) sugar, sometimes called yellow crystals, and it is a great pity that it is not better known by the public. Something will be done, no doubt, to advertise it by the Government under their scheme for expending a grant of £1,000,000 per annum to encourage the consumption of Empire produce. The Imperial Economic Committee, which controls the administration of this grant, follows admirably upon the British Empire Exhibition, and will ensure that its lessons are not forgotten. The West Indies and British Guiana are fortunate in having Sir Edward Davson on the Committee, and I have no doubt he will keep their needs well to the forefront.

A new Canada-West Indies Trade Agreement, of a more comprehensive nature than its predecessors, was signed in July last. Its value, however, will depend on the extent to which it is supported by transport facilities.

In Jamaica conditions during the past half-year have not been favourable owing to the poor demand and low prices for bananas, the most important product of the island. I am glad to hear, however, that large quantities are now being taken, both for the English and American markets. Fortunately seasonable weather has been experienced, and a considerably increased crop of sugar has been exported. Jamaica is an island capable of considerable development if given further shipping facilities. She produces other tropical fruits besides bananas, such as mangoes, all of which will be welcome here or in Canada. As a tourist centre the island is already largely patronised by Americans, but we hope that one of the results of the excellent propaganda work done at Wembley will be to induce many British who are fortunate enough to be able to spend the winter months abroad to visit this picturesque island with its delightful climate.

Trinidad has experienced favourable weather, and the sugar crop, nearly 70,000 tons, is the highest for some years, whilst prospects for the current crop are also good. The improvement in cocoa prices has unfortunately coincided with a very poor crop. We hope the price will be maintained until the next crop is available, so that this important industry can reap the benefit. In terms of export values, petroleum, with its by-products which were returned at £1,367,000 in 1924, is now the most valuable export of the island. Last year's production was 113,000,000 gallons, and this year's output promises to equal, if not excel, this figure. The Colony's public finances are improving, and trade conditions are better.

The Barbados sugar crop reached the satisfactory figures of 48,000 tons of sugar and 66,000 puncheons of molasses. For the growing crop, however, prospects are not so good, as more rain is wanted. It must be a matter of much gratification to the retiring Governor, Sir Charles O'Brien, to know that he leaves the finances of the Colony in such good shape, that there is a substantial reserve for bad times, and that the Government has been able to reduce the income tax by 50 per cent., an example we all hope will be followed at some future date by another island in the British Empire not so far from home.

The Leeward Islands of St. Kitts and Antigua have turned out record sugar crops, the former being 15,500 tons and the latter about 17,000 tons. The last figure is more than double that for the previous year, and is due to the very favourable weather which has been experienced.

Owing to the satisfactory prices for its products of cocoa, nutmegs, mace and cotton, conditions have very much improved in Grenada, and the prospects of next season's crops are also good.

St. Lucia has made a sugar crop above the average, and favourable weather gives promise of a good crop next year. The banana cultivation in that island is increasing, and shipments have been commenced. We shall watch the progress of this new venture with great interest.

British Guiana has enjoyed very favourable weather, and the main crop of sugar may be expected to show an increase. A Forestry Department is being organised, and we must look forward to the time when the vast timber potentialities of this great country can be properly developed alongside of its important mineral resources.

It is with mixed feelings that we hear that the Governor, Sir Graeme Thomson, has had to leave Demerara to take up the Governorship of Nigeria, for, whilst we share the regret of the Colony at losing such a good Governor after but a short term of office, we welcome his appointment to Nigeria. He is being succeeded by Sir Cecil Rodwell, formerly Governor of Fiji, to whom we wish every success.

RESEARCH ON TILLAGE PROBLEMS.

PROFESSOR J. SYDNEY DASH, B.S.A.

To the investigator who considers research only in terms of microscope or test tube, the heading of this article may seem strange and incongruous. Undoubtedly, the word research is enjoying a very great popularity at the present time as a result of the late war which has stimulated systematic enquiry and investigation in every branch of human activity, and while often misapplied or used without adequate knowledge of what is involved, we feel on certain ground in this connection, considering the importance of tillage and the recognition given to its study during recent years at institutions such as Rothamsted, of which unhappily there are all too few.

One of the difficulties attached to ploughing, an outstanding tillage operation—carried out in many instances without any knowledge of the underlying principles and merely as a practice handed down from previous generations—has been the impossibility of measuring its value in crop production in precise terms, in the same way let us say as the chemist may measure manure values or the physiologist moisture values. In connection with any tillage operation consideration must be given to both efficiency and costs, and both type of implement and texture of soil are involved. Thus, on light soils, less power, less time and in the long run less outlay are required than for similar operations on heavy soils. In extreme cases, such differences are well defined and comparatively easy to judge, but in numerous instances, it is impossible to tell with any degree of accuracy what adjustments in respect to force in order to meet varying soil conditions and irregularities should be made. Where power implements are used, the absorption of power and increased consumption of fuel are economic factors of first importance. The relation therefore of draft or load to tillage costs constitutes a problem which the agriculturist striving towards efficiency cannot afford to ignore.

At Rothamsted, careful measurements have shown that a field seemingly uniform to the eye may possess soil irregularities which have been responsible for marked differences in drawbar pull. Under these conditions, where animal traction is used, differences are not so apparent as the ploughman controls the work and he will ease or hold the plough in accordance with variations in the nature of the land. The whole question obviously is a complex one since, apart from soil properties, such things as plough design, relation between design and draft for different speeds, depth, materials of construction, methods of attachment, &c., have an important bearing on the final results. Both soil and implemental factors combine to determine the resistance that must be overcome by any tractive force operating the implement. From a report on investigations carried out at Rothamsted by B. A. Keen and W. B. Haines, and which has appeared in the *Journal of Agricultural Science*, it is learned that the authors have succeeded in measuring and recording draft as a continuous trace by the use of a special dynamometer which they describe in the article referred to. They state that with it comparisons may be made of the draft of different implements in the same soil, the resistance offered by different soils, the effect of moisture content, climatic conditions, cultural variations, &c. Such records wherever obtained will be of great value both economically and scientifically.

As a result of this discovery, it should be possible, for example, to determine with a fair degree of accuracy the amounts of soil amendments in the form of lime, ground limestone, organic matter and other materials which, added to stiff soils, are capable of effecting economies in load reduction of any tillage tool and how to obtain the best results by such practices. Certain observations on relative values in this connection have already been made, reference to which appears in *Tropical Agriculture*, Vol. II, No. 2, pages 36-37. Further developments from the practical viewpoint are the assistance these studies provide in the matter of computing fuel costs and in the care and intelligent handling of modern implements and machinery. From a scientific standpoint, the principal value of a recording unit of this type will be found in the making of field surveys of soil conditions and characteristics, especially where the laying out of field experiments is contemplated. A still further result of this investigation has been the development of an electric device for reducing friction on moist substances and which it has been found possible to utilise in ploughing, the current being passed through the soil having the mouldboard as the negative electrode. In these conditions, a water movement is set up through the moist soil towards the negative electrode—the mouldboard, which becomes covered with a water film, this serving as a lubricant and reducing the ploughing draft. The Rothamsted Report for 1923-24 states that the device is simple in principle and only awaiting exploitation to become important in practice.

In the tropics, it will be admitted, we are still groping in the dark in respect to many of our soil problems. Some are intimately associated with those of pest and disease control, as is the case apparently in Trinidad at the present time where froghopper injury to canefields is causing great anxiety and where little hope is entertained of ultimate control by artificial means. With the changed outlook in the matter of crop production costs, there is a tendency for those getting a living from the land to be restless, to be inclined perhaps to adopt short cut methods which may seem cheap, but which in reality are inefficient and more costly in the long run. These investigations at Rothamsted in connection with the fundamental practice underlying crop production—tillage—are refreshing and stimulating. and serve as a reminder that in patient and persistent work lies the sole hope of real agricultural permanency. Let it be clearly emphasized,

however, that in the tropics for a full measure of success to be achieved, the outlook in research must be broadened. The microscope and the test tube are no longer sufficient for our needs; whatever else may be necessary, field conditions are such that the agricultural engineer with the plough, the tractor, the dynamometer and other mechanisms must be given facilities to add his quota to the sum total of our knowledge in the business in which we are engaged—that of raising crops and striving to do so profitably against heavy odds.

AGRICULTURAL NOTES.

COMPILED BY THE COLLEGE DEPARTMENT OF AGRICULTURE.

Inoculation of Leguminous Crops.

RESEARCHES on this subject are in progress at Rothamsted. The following summary gives an idea of the more important results so far obtained and which have been recorded in the Report of that institution for 1923-24.

Efforts have been made, ever since the discovery in 1890 by Hellriegel and Wilfarth of the association between micro-organisms and leguminous plants, to improve the growth and usefulness of such plants by adding the appropriate organisms to the soil. Successes have been reported in Europe, while in the United States and Canada the supplying of cultures of the necessary bacteria to farmers for seed and soil inoculation, in order to induce good stands of clovers and other legumes, has become a recognised routine practice in agricultural departments and commercial laboratories. It cannot be said, however, that success is always achieved. In England, the failures have, in many cases, been traced to several circumstances—organisms already present but some condition essential to plant growth was deficient and could not be remedied by merely adding more organisms; difficulty of transporting material alive; too great a degree of acidity in the soil for favourable growth of the organisms. In addition, a much more difficult problem has presented itself and which appears to have been solved satisfactorily at Rothamsted, namely, the discovery that the organisms could pass through a life cycle including motile stages in which they can travel to the plant and non-motile stages in which they cannot. The latter, it seems, can be made to change into the former by certain treatments, notably the application of phosphates. In this connection, some remarkable effects have been obtained by the addition of basic slag to certain clover lands. The time required for the organisms to change from the non-motile to the motile form in the soil and the rate at which they spread have also been investigated; this has an important bearing on inoculation methods to ensure early infection of the roots.

Following on the above, two other lines of study have been opened up. The first has to do with the influence of straw on root nodule formation, farmyard manure having been found more effective than dressings of artificial fertilizers. It seems, however, that straw alone is not efficient in this connection without the addition of phosphates. The second is the discovery that boron appears to be essential to the growth of many leguminous plants and to ensure the proper functioning of the root nodules. Conducting vessels grow out from the vascular system of the plant and enter the nodule, thus serving to transport food materials from plant to bacteria and *vice versa*; in the absence of boron these necessary connecting links between the plant and the bacteria do not form or are very weakly developed. Fortunately, in most soils boron is already present in sufficient quantities, but instances are recorded from Japan where peas which do not need boron will grow and other legumes needing it will not, thus suggesting boron deficiency in those soils.

For the agriculturist to obtain the maximum assistance from these legume bacteria which fix free atmospheric nitrogen, they must be supplied with suitable growth conditions and the plant itself must have proper nutrition. No miracle is here performed: it is simply a question of a combination for mutual benefit between plant and organism, and from which man stands to gain in proportion as he plays his part. The results of the investigations herein outlined should help him to do that effectively.

An odd variety of poultry.

IN the *Journal of Heredity* for November, there is a description of certain structural characters in an odd variety of fowls known as "Creepers" or "Brevicrews." They differ from other forms in the wings and legs which are very much shortened, and especially in the case of the legs, so that the birds appear to creep instead of walk. They are normal, however, in other respects. When standing these birds are so low to the ground as to give the appearance of sitting. The bone often referred to as the "drumstick" is the principal one affected and in its development appears to resemble older reptilian types, suggesting that these abnormalities are atavistic in character.

It is stated that the Brevicrews as a breed are just as fine as any other, being about the size of Plymouth Rock, and that by careful crossing they may be had in any of the standard breeds, of any colour and type of feathering. They are reputed to be good egg producers, but are handicapped for running, scratching or flying; an advantage in the last case is that they can be kept in pens with low fences. The Brevicrews possess exceptional qualities as sitters and mothers. In walking they can hardly lift their feet so there is little danger of the young chicks being crushed; moreover, being very low set naturally, the hens are always in a position to give ample protection and warmth to the young brood.

Sugar-cane Syrup.

THE United States Bureau of Chemistry has recently issued Bulletin No. 1370, entitled "Sugar-cane Syrup Manufacture." It is a compilation dealing with all phases of the subject, including canning and marketing. A number of the best authorities have contributed so that the bulletin is both comprehensive and authoritative. Syrups produced from various sources in the United States in 1919 amounted to 170,671,000 gallons; of this total sugar-cane syrup represents 38,183,000 gallons. While much of the information has reference more particularly to American conditions, the chapters dealing with comparison of methods of manufacture (in which special attention is given to clarification), prevention of crystallization by the invertase process, canning and marketing, are of wide practical interest. The bulletin is the most complete work on the subject which has so far appeared and should be of very great help to those interested in syrup manufacture and disposal.

In some of the West Indian Islands, notably Barbados, the manufacture of syrups direct from cane juice has been profitably carried on for many years in small plants. This produce has usually found ready buyers in Canada and to a lesser extent in the United States. Indeed, it not infrequently happens that syrup making is more remunerative than sugar. Owing to the methods of disposal in the past and the clumsiness of the puncheon package used, it has not been an easy matter to secure uniformity in the product or to considerably extend the market, demand at present being largely confined to areas within comparatively easy reach of the ports of entry. The methods of manufacture, grading and marketing are being subjected to careful enquiry at the present time in Barbados, and it is hoped that as a result, the trade in this supplementary product to sugar will be considerably stimulated. A handy, attractive package would do much to establish confidence and increase the demand. If this aim is kept in view, the prices of such a palatable and nutritious sweet should tend to become more and more stabilized, irrespective of sugar trends.

AT the formal opening of the annual session of the legislature of British Guiana, His Excellency Sir Cecil H. Rodwell, K.C.M.G., the recently appointed Governor in the course of his speech stated that while in Trinidad on his way to British Guiana "I was enabled through the courtesy of His Excellency the Governor and the Principal, Dr. H. Martin Leake, to inspect the Imperial College of Tropical Agriculture. I was greatly impressed by all that I saw and it seems to me that the contributions made by this Colony towards the Institution is a sound investment."

The Editor will be pleased to send a gratuitous specimen copy of *Tropical Agriculture*, post free, to anyone interested in tropical development.

TRINIDAD COCOA.

IN connection with the notes on "Trinidad Cocoa" which appeared in our November issue, we have been favoured with the views of a number of planters and merchants. In general it is admitted that the preparation and marketing of Trinidad cacao can and should be improved but it is asserted that the lack of improvements is not due to the ignorance of either planter or merchant but rather to the unwillingness of the merchants and manufacturers in consuming countries, to pay the full premiums to which well prepared and properly graded cacao is entitled. The Hon. G. F. Huggins, O.B.E., a prominent cacao planter and merchant, stated at a meeting of the Trinidad Chamber of Commerce, to which we refer below, that recently, while in New York, he was asked to lower the quality of his plantation cacao in order that he might compete successfully with those merchants marketing a mixed and inferior quality. It has been pointed out by others that the local Department of Agriculture, The Imperial Department of Agriculture, the Agricultural Society and kindred bodies have distributed a great amount of instructive literature on the growing and cultivation of cacao, and that the planters and merchants can and will produce and market better prepared cacao of uniform quality if and when the markets are willing to pay an adequate premium. It is not denied that some exporters of dubious reputation do market a cacao of a quality inferior to what it is represented to be but it is emphasized that these individuals are in a minority. Merchants complain that the exigencies of the market demand that they shall "blend" or mix cacaos of various grades. An instance is cited of a cacao planter who, under exceptionally favourable conditions, produced cacao of a very fine quality which deservedly secured a small premium. "While waiting for payment," writes our correspondent, "to the planter's disgust and surprise he saw his beautiful cacao dumped in a large heap of other cacao. He was so taken back that he questioned the purchaser who told him he used his (the planter's) cacao, 'to blend'." This admittedly is contrary to all rules of good marketing and it is essential that a remedy should be found. It must not be imagined that all Trinidad cacao can or will be properly prepared and graded. As correspondents have pointed out there will always remain the difficulty of the small dealers and small transactions. "Women," for example, "bring a few pounds in a handkerchief which they sell near the market to a dealer with whom they have been friendly for many years." Such small quantities are not properly prepared and cannot be graded except at impossible expense but there is no reason why such cacao, which in the aggregate amounts to a comparatively small quantity, should not be exported, provided that it is not misrepresented as being of a superior type or grade.

The *Gordian* appears very sceptical of the possibilities of the Co-operative Society of Cacao producers and suggests that, "if in Trinidad it is felt that more can be done for the industry by

establishing an association, then Trinidad should take the lead." This is precisely what Trinidad proposes to do, and we have no doubt that if the active co-operation of the manufacturers, which the *Gordian* promises, is forthcoming, the efforts of the Society will meet with success. At the last meeting of the Trinidad Chamber of Commerce Mr. J. Forbes, Manager of the Cocoa Planters' Association, moved the following resolution: "That in the opinion of the Chamber it is important that action be taken by the Chamber of Commerce and kindred bodies to prevent shipments of cacao beans from this Colony under the marks of Plantation and/or Estates which are improperly so graded, due to the admixture of Ordinary beans, waste, &c., to the general detriment of the industry of the Colony." He suggested that with the co-operation of the Government a simple and effective inspection could be carried out, and urged that "passé," "sweepings," and "wings" should be thrown away as unsaleable. The Hon. G. F. Huggins, O.B.E., in seconding the resolution, emphasized that the number of exporters practising the system of "commercial immorality" by which inferior types of cacao were shipped as plantation cacao was very small, and hoped that the business men among themselves would devise a means of coping with such an evil. He suggested that the Chamber should invite the co-operation of the Agricultural Society and the Cocoa Planters' Association and form a committee to devise ways and means whereby the commercial body in the City could regulate its affairs, and not go to the Government and ask it to legislate and do something which the commercial community itself could not carry out. He emphasized that Trinidad was producing excellent cacao year after year but it was essential that they should not allow any deterioration from that standard.

The Hon. A. V. Stollmeyer, in emphasizing the need for a Committee to go into the matter, felt that Trinidad plantation cacao could be marketed in the proper method only through the aegis of the Government. He expressed grave doubts as to whether a movement by the merchants to improve the shipments of cacao would materialise. Messrs. Majani, P. Dumoret and Masson agreed with the previous speakers that steps should be taken to investigate the matter and to formulate definite proposals. Mr. Cory Davies, President of the Chamber, nominated members representative of various sections of the industry, "to Collaborate with delegates of the Agricultural Society, the Co-operative Society of Cacao Planters, the Cocoa Planters' Association, and any other person or persons, for the purpose of formulating recommendations as to the ways and means to give effect to the purpose of the resolution." He suggested that the Co-operative Society of Cocoa Planters, representing all sections of the industry, would be a better authority for formulating rules and regulations, appointing inspectors, and issuing certificates than the Chamber of Commerce. The expenses might be met either by fees or from a cess on the export of cacao. Sir Francis Watts, K.C.M.G., D.Sc., President of the Agricultural Society and of the Co-operative Society of Cocoa Producers, said he regarded it as absolutely essential for the welfare of the industry that some action should be taken and that he had already been approached with the idea of bringing the matter before the Agricultural Society.

WE regret that the above notes were crowded out of our last issue. Since then events have moved rapidly. At a meeting of the Agricultural Society the Hon. A. B. Carr moved a resolution similar to that brought before the Chamber of Commerce by Mr. Forbes. Mr. Carr stated that Trinidad cacao was known in the world's markets for its high quality and it was important that that quality should be maintained. The grading of products was now considered a necessity and he did not know why Trinidad should find any difficulty in falling into line with countries which had preceded it in that direction. He mentioned that Ceylon and Java cocoas were graded and added that recently Brazil, which was one of the largest growers of cocoa, had got Government support in attempting to maintain the quality of their cocoa. The Hon. A. V. Stollmeyer, in seconding the motion, stated that he did so because he felt that it would have far reaching benefits. They must try to place their cocoa on the various markets in the best form possible particularly in view of the fierce competition which they had to face. Captain the Hon. A. A. Cipriani, in supporting the motion, stated that during his recent visit to London he had discussed the question with a number of interested persons and they were unanimous in urging the maintenance of the quality of Trinidad cocoa. Mr. Cory Davies, President of the Chamber of Commerce stated that the Chamber desired to take no false credit for the introduction of the resolution since it had been undertaken with the collaboration of the President of the Agricultural Society. The motion was carried unanimously by the meeting.

Subsequently a committee composed of representatives of the Chamber of Commerce, the Agricultural Society, the Cocoa Planters' Association, and the Co-operative Society of Cocoa Producers, together with the Director of Agriculture and the Professor of Economics of the Imperial College of Tropical Agriculture, met and discussed the broad outline of the scheme for grading Trinidad cocoa. A special sub-committee was appointed to discuss the scheme in further detail, their report being accepted unanimously by the major committee. This scheme has been forwarded to the Government requesting that the necessary legislation be passed to empower a committee appointed by the interested bodies to undertake the grading of all Trinidad cocoa exported from the Colony.

C. Y. S.

Readers are requested to inform the Editor immediately of any change in address.

MYCOLOGICAL NOTES.

Panama Disease of Bananas in the Canaries and West Africa.

ACCORDING to information received from the Director of the Imperial Bureau of Mycology, Panama Disease is present in the Canaries on the Cavendish banana (known in the West Indies as Dwarf, Chinese and Governor) and in Sierra Leone on the Gros Michel and Guinie Negro varieties. The Cavendish banana is regarded in the West Indian Region as either very highly resistant or immune to the disease. In Jamaica, for instance, it has not been found to be attacked and is considered there to be immune. In Central America it has been reported to be occasionally affected by a wilt resembling Panama Disease and a fusarium has been found in the vascular system which differs somewhat in culture from *Fusarium Cubense*, the recognised cause of the disease on susceptible varieties in the West Indian Region. About 15 years ago when Gros Michel was attacked by Panama Disease at the St. Augustine Experimental Station in Trinidad, the Chinese banana was substituted for it and developed a disease when supplied to infected spots which the then Superintendent believed was the same disease as that on the Gros Michel. The Mycologist, however, did net record the disease as attacking the Chinese banana. If may be added that the fusarium isolated from the vascular system of affected Cavendish bananas in the Canaries behaves in culture like *Fusarium Cabense* of the West Indies. Dr. Butler has suggested, therefore, that the fusarium in the Canaries may be a different biological strain from that in the West Indies. As the strain or strains of the fungus present in the West Indies rarely, if ever, attack the Chinese banana there it is highly undesirable that the strain in the Canaries should be introduced into the West Indian Region where the Chinese banana is widely cultivated by the peasantry and might become in the near future acceptable for export to northern markets. It would be prudent to forbid the introduction of banana suckers from the Canaries into any British West Indian territory except for experimental purposes and then only if they have been taken from plants grown in quarantine and are certified by a competent authority free from Panama Disease.

Control of Angular Leafspot of Cotton.

THE widely distributed disease which manifests itself on the foliage as an angular brown spot and as narrow brown lesions along the veins, on the stems and branches as dark sunken spots and patches know as blackarm, and on the bolls as black rounded spots or diffuse browning is caused by *Bacterium malvacearum* E. F. Smith.

Sea Island, Egyptian and Upland Cottons are all susceptible to attack under favourable wet weather conditions. Infection may occur on the unwounded surface, the invading bacteria entering through the stomata; there is a rather long incubation period of 12 days to 3 weeks before the earliest signs of infection become visible. It is probable that most of the primary infections on the bolls occur in the flowers, the lesions showing up on the bolls 2 or 3 weeks later. The direct loss may be appreciable in wet seasons, but the indirect injury is more serious as the lesions caused by the bacterium are ports of entry for a number of other parasitic and saprophytic organisms mainly fungi which grow beyond the dead spots and rot and destroy the interior of the bolls or stain and spoil the lint. The control of the primary pathogene, therefore, prevents more or less serious injury by other micro-organisms.

There is good evidence that the bacterium is carried over from one season to the next mainly on the surface of the seed coat as no internal infection of seeds capable of germination has been observed. There can be no doubt that the disease can be introduced into territory not previously infected on cotton seed. Investigations extending over a number of years by the South Carolina Experiment Station have shown that under conditions in that State angular leafspot can be completely controlled by seed disinfection. The method recommended is delinating with strong sulphuric acid washing immersion for ten minutes in 1 part per 1,000 corrosive sublimate washing and drying. The destruction of the fuzz is necessary in the case of Upland varieties but it is doubtful if sulphuric acid is called for in handling seed of Sea Island and other varieties which retain very little fuzz. Convincing proof of the efficacy of surface disinfection of seed has been recorded by C. A. Ludwig in plot trials.

As the disease is easily spread by driving rain and rain splash, care was taken to separate the plots sown with disinfected and untreated seed by means of interplots of corn or corn and velvet beans from 24 to 35 feet wide. At one station there were no infected plants on the disinfected seed plot 47 days after sowing, while 64 per cent. of the plants on the untreated seed plot showed angular leafspot; after 78 days the proportions were 3 and 53 per cent. At another station 92 days after sowing 7 per cent. of the plants on the disinfected seed plot and 85 per cent. on the untreated seed plot showed the leafspot. The late appearance of disease on the plots planted with treated seed was due to infection from outside the plots; on the other hand the untreated seed plots showed 36 to 24 per cent. of the stand infected 33 days after planting indicating clearly that infection of these plots had been due to the seed. In 1923 trials along similar lines were made at the Experimental Station in St. Vincent with seed taken from infected bolls of Sea Island cotton. The seed was divided into 7 duplicated lots and given the undermentioned treatment:

1. Control—No treatment. 2. Soaked in corrosive sublimate 1 part in 1,000 for

15 minutes. 3. Stirred in sulphuric acid until the lint was removed, washed, immersed in corrosive sublimate 1 to 1,000 for 10 minutes. 5. Immersed in Izal 1 part in 500. 6. Immersed in Izal 1 part in 250. 7. Immersed in Izal 1 part in 375.

All treated seed germinated as well as the control, in fact, rather better. Details are lacking in regard to the distance separating the plots and apparently no interplots of some tall growing crop were planted. The plots were, therefore, fully exposed to infection from one another and from outside sources. The untreated seed plot showed 37·5 per cent. of plants with angular spot 48 days after sowing, but there was no infection on the plots planted with seed lots 2, 3 and 6. After 65 days 6 of the plots showed infection ranging from 12 to 40 per cent.; the plot planted with lot 6 had only 8 per cent. of infected plants as against 40 per cent. on the control plot. In spite of the lack of precaution to protect the plots from outside infection there was clear evidence that the treatment of seed lots 2, 3 and 6 had prevented infection 48 days after planting. It is of interest to note that immersion in Izal 1 part to 250 parts of water (presumably for 15 minutes) did not affect germination and appeared to have effectively killed the bacteria on the surface of the seed coats of Sea Island cotton which retains very little fuzz. It is probable that this disinfectant at the same strength and other similar disinfectants would be effective with seed of other varieties which retain little fuzz. There can be no doubt that large scale plantings could be effectively protected from angular spot and the more serious indirect loss resulting from it, by means of seed disinfection especially where a close season is enforced.

S.F.A.

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Identification of Sources of Vanilla Extracts.

UNDER this title, Dr. C. B. Gnadinger, in *Industrial and Engineering Chemistry* for March, 1925, p. 303, describes a chemical method for differentiating between extracts of vanilla pods of various commercial grades. The best varieties of vanilla, such as Mexican, Javan, and Bourbon, contain little or no anisyl alcohol, whereas inferior grades, such as Tahiti, and also certain vanilla substitutes, such as vanillons, may contain as much as 0·06 per cent. of their weight of anisyl alcohol. Anisyl alcohol gives a very sensitive red colour reaction with concentrated sulphuric acid, and this forms the basis of the test whereby the source of a vanilla extract may be readily identified.

PROFESSOR LEFROY.

PROFESSOR H. A. BALLOU, M.SC.

HAROLD MAXWELL LEFROY, Professor of Entomology at the Imperial College of Science and Technology at South Kensington, a recognised authority in Economic Entomology, died in England on October 14th, 1925, as the result of accidental poisoning while experimenting with poisonous gases for insecticide purposes.

Born in 1877, Mr. Lefroy was educated at Marlborough, and Kings College, Cambridge. In 1899, he was appointed Entomologist on the staff of the Imperial Department of Agriculture for the West Indies, which position he held until 1903, when he went to India as Economic Entomologist to the Government of India, where he remained until 1912. While in the West Indies, he studied the insect pests of the principal crops, publishing an excellent account of the Moth Borer of the sugar-cane, and papers on the Scale Insects of the West Indies. While in India, in addition to his studies of pests of crops and the development of methods of control of such pests, he gave much attention to the improvement of the production of lac and silk. In 1912, he returned to England and became Professor of Entomology at the Imperial College of Science and Technology which post he held until the time of his death. After joining the Imperial College of Science and Technology, he developed a remarkably valuable course in Economic Entomology and devoted a very large amount of time to the development of insecticides and methods for controlling insect pests of all kinds.

During the war, he went to Australia to suggest measures for freeing stored wheat from the granary weevil and for protecting the new crop against its attack. Also, he went to Mesopotamia to suggest measures for the control of flies, the house fly and the lesser house fly, for the protection of the troops from the intestinal diseases disseminated by these insects.

His work in saving the oak roofs of Westminster Hall and many other old and historic buildings after their timbers had been attacked by the death watch beetle is an outstanding feature in latter day entomological effort.

Professor Lefroy met his death as the result of accidental poisoning from an insecticide gas with which he was experimenting for the control of the house fly, to which line of work he had devoted his attention for some time.

A man of rare enthusiasm and energy, a captivating personality and remarkable ability, Professor Lefroy and his work will long be remembered both on account of the lamentable circumstances of his death in the pursuit of scientific knowledge and for his great achievements in the field of science as applied to Economic Entomology.

LEPROSY.

Relief Association Conference.

AT a conference of the Medical Committee of the British Empire Leprosy Relief Association with Dominion and Colonial medical officers, Sir John Rose Bradford presided, and in addition to Dr. G. T. Rutherford, Chief Medical Officer of the Colonial Office, there were present medical officers from South Africa, Kenya, Uganda, Nigeria, Southern Nigeria, the Sudan, Zanzibar, Sierra Leone, British Guiana, the Gold Coast, the West Indies, British Honduras and Hong-Kong.

Sir Leonard Rodgers spoke of the feasibility and importance of a scheme to distribute to all the tropical Colonies next year the seed of *hydnocarpus Wightiana* and *hydnocarpus anthelmintica*. He announced that Dr. Muir, of the Calcutta School of Tropical Medicine, had discovered that the pure ripe seed of the former, which grew very abundantly in Southern India, yielded such a pure oil that it could be injected without conversion to ethyl esters, with little or no pain, and apparently with at least as good results as the esters, costing ten or more times as much. The tree furnishing this oil would fruit in five or six years, and for eight months in the year, so that in a few years any colony where leprosy presented a problem would be able to furnish its own supplies at very little cost.

It was suggested that in British Guiana, the West Indies, the Malay States, Fiji, &c., where segregation was compulsory, the practice in South Africa of enforcing such segregation only in the active infective cases should be pursued. Dr. J. A. Mitchell, Director of Health, South Africa, stated that the investigations of a committee showed at the first examination that 28 per cent. of the 2,500 inmates were uninfective cases, mostly very chronic nerve cases. The number was increased to over one-third of the total after a second comb out. All uninfected patients who had relations to go to were released. This measure had already done much to remove the opposition to compulsory segregation; the lepers now realized that they were sent to the institution for treatment, and would be released if they become uninfective.

Sir Leonard Rodgers stated that the replies to the questionnaire of the Medical Committee received from backward areas, such as parts of tropical Africa, showed that any general compulsory segregation was not practicable. In one case there had been the successful experiment of sending out patients from the leper colony in pairs through the villages to persuade other sufferers from the disease to go there voluntarily. He suggested that the confidence of the indigenous population might be gained by the new methods of treatment, and it might be possible to get many more of the infective cases voluntarily to reside in leper villages within reach of a weekly visit from a medical officer.

The conference agreed that colonies or sanatoria with land for cultivation and expert treatment were required for all infective cases, separate accommodation being advisable for the incurable and often uninfective advanced cases when they were admitted. It was also generally agreed that compulsory notification was necessary in countries enforcing segregation. The training of medical men in the early diagnosis of leprosy was held to be a necessary part of the curriculum of all medical schools in leprous areas.

The great success of the Viceroy's Leprosy Appeal Fund in India, where the equivalent of £130,000 has been raised, has encouraged the Executive Committee of the British Empire Relief Association to develop plans for the formation of auxiliary organizations in other countries. With this end in view, Mr. F. Oldrieve, the Secretary, will proceed to West Africa at the beginning of next year and will later go to the West Indies. The Colonial Office had promised the fullest co-operation in the arrangements made for these visits, and the active assistance of several of the Governors of the respective colonies was already secured.

GRENADA DURING 1924.

THE Annual Colonial report for Grenada for 1924 (No. 1263) records the fact that the Acting Governor, Lieut.-Col. Davidson-Houstin, C.M.G., paid a visit to the island by a United States flying boat. This event, unique in the history of the Colony, opens up possibilities of improved means of communication between the numerous and scattered islands of the West Indies. An unfortunate sequence of annual deficits has rendered strict retrenchment necessary in order to balance the Colony's budget. By effecting economy among the various spending departments, amalgamating offices whenever possible, and stopping expenditure upon activities beyond the means of the resources of the island, coupled with a slight addition to taxation, a balance of £11,450 was realised. The total current deficit was reduced from £36,996 to £25,546 during the year. An improvement in the prices of nutmegs and mace considerably relieved the financial stringency from which the Colony was suffering. The value of the nutmeg crop increased by £40,304 to £95,321 and that of mace by £6,233 to £24,874. The Colony's main crop is still cacao and during the year the quantity exported increased in value by £45,664 to £201,547, due mainly to an increase in quantity. Cacao has long borne the brunt of the heavy export taxation enforced as a war-time measure but continued on account of the Colony's indebtedness. The change in the relative importance of cacao and spices led the Government towards the end of the year to adjust the incidence of taxation on these crops by reducing the export tax on cacao by 6*d*. per cwt. and increasing the export duty on nutmegs and mace by means of a graduated scale, rising and falling according to market prices.

IMPERIAL TOBACCO.

THE Tobacco Committee of the British Empire Producers' Organization addressed some time ago a series of questions to each of the Dominions and Colonies, with a view to discovering the extent of and the possibilities of development of the Imperial tobacco industry. The replies have now been received and analysed. They constitute, it is stated, striking evidence of the existence of great opportunities for development, and an unanswerable argument for the preservation, protection, and encouragement of an industry which, as a whole, is still nascent, but which, by wise administration and judicious expansion, might fulfil the highest expectations from the point of view, not only of Empire monopoly, but of world-favour.

The primary conclusions to be drawn from an analysis of the replies to the *questionnaire* are stated in a report prepared by the British Empire Producers' Organization to be as follows :—

There are vast possibilities for extension of the tobacco-growing industry in the Empire.

The necessity for intra-Imperial preference, which could only benefit the industry as a whole, is indisputable.

Greater attention might be paid by the respective Governments to the development of tobacco growing within their areas.

The cultivation of public taste for Imperial brands is an important factor.

The complete independence of the Empire as a whole of foreign supplies is a remote possibility. The amount of "exotic" crops which need be imported is, however, negligible.

Reviewing the Empire position broadly, it is a fact, significant of the possibilities of "self-sustenance," that production is greater than import. But there is much to be done before indications materialize into established conditions. Although the acreage available for extending the tobacco industry is immense, there is, generally speaking, a lack of transport and labour facilities, a "tightness" of available capital, and a half-heartedness in the matter of scientific administration and development of and research in the industry. One cannot but feel that, if the industry was taken well in hand as, say, in Canada, and if research and experimental work was carried on as persistently as it has been in Ireland and, to some extent, in India, the production would increase vastly, and an appeal would be made to tastes which the Empire cannot at present suit.

There is also the supreme obstacle of foreign competition, especially from America, most of the countries of the Empire do not see why British produce should not be substituted largely, if not entirely, for foreign. "There is," says the Canadian report, "no reason why tobacco of foreign origin should not be replaced by British Empire tobacco, as long as the quality will comply with the trade standards of this country." Before this consummation (which, of course, is in some cases disputed) can come to pass, however, certain factors will have to be taken seriously into account.

The first is what one report terms "the long-established cult of American tobacco." The Irish report stated that "It would appear that Virginia and Kentucky tobacco must continue to occupy an impregnable position in these markets unless there is such a reduction of preference in the duty as will render it economical to manufacture and smoke relatively dry, mild tobacco which has been improved, if necessary, by means of fermentation." It might be pointed out, however, that not only is our manufactured trade holding its own with America, but that tobacco of the Virginia and Kentucky varieties can be grown in Nyasaland and Rhodesia, and that, as we have already observed, the statement is made that "its market would increase if the preference was increased." A second factor is psychological, which concerns chiefly native consumers and their ingenuous conservatism in the matter of patronage.

Even at home the psychological consideration is operative. It is certain that only a little persuasion is necessary to spread the habit of "smoking Imperially." A third factor is the strong favour in which certain tobaccos are held, tobaccos which, unhappily, cannot very well be grown elsewhere. This applies particularly to Chinese and Cuban products. But if the Empire could capture for her own needs all save these extraneous brands, she could well afford to let them go unchallenged. At the same time, one cannot forbear to remark that Jamaica exports large quantities of very fine cigars and that there are possibilities for extending this industry and making appreciable encroachments upon the Cuban markets.—*The Times.*

BECHUANALAND IN 1924–25.

DURING the year 1924-25 the Union Government Cotton Breeder at Rustenburg Experiment Station visited the Protectorate for the purpose of giving instruction to European farmers in regard to cotton growing. His report indicated generally that the average rainfall in the Protectorate was scarcely sufficient to ensure the best results, but that, given proper management of the soil, and planting not later than October, experiments in various localities might be well worth while. The native population has been advised to defer planting cotton until the result of the experiments by Europeans are more definitely known. The locust campaign, begun in 1922 was continued through the year 1924-25 with good results, due largely to the careful organisation of the work before the rains set in. The campaign cost approximately £21,299, not including poison, pumps, barrels, &c. The natives are mainly engaged in cattle rearing. The distribution among the various tribes of pure-bred bulls, purchased out of a fund maintained by the natives themselves, and the restriction of cattle exportations to the Union to a certain weight of animal, have contributed in different ways to the improvement of native stock. Owing to the various restrictions upon exports, some of recent imposition, the cattle industry is not as flourishing as it might be and during the period under review a diminution of 25 per cent. in numbers was experienced. The export of sheep and goats, on the other hand, showed an increase all round of 13 per cent.

TROPICAL WORLD NOTES.

The Sudan.

Mr. F. Eckstein, Chairman of the Sudan Plantations Syndicate, Ltd., gave an interesting account of the development of the Company at its 18th ordinary general meeting, held in London. The Syndicate was originally formed in 1904 as a private concern with a capital of £80,000. The twenty-first year of the history of the Syndicate thus coincides with the completion of that great engineering work, the Makwar Dam. The issued capital now amounts to £600,000 valued by the Stock Exchange at roughly £5,000,000. The shareholders numbered 2,500. In 1904 a few hundred acres were cultivated at Zeidab. To-day, including the Kassala Cotton Company, in which the Syndicate is largely interested, there are 100,000 acres under cotton. In all there are about 10,000 tenants, and assuming an average of five heads to every tenant family there are 50,000 working partners earning a very substantial livelihood. The season 1924-25 was much the same as that for 1923-24. Zeidab again produced a good paying crop of American cotton, while the Gezira crop was unsatisfactory. Notwithstanding all precautions and special seed treatment, the cotton plants were again attacked by blackarm and thrips, but high cotton prices more than made up for low yields. The whole new area has since been planted with entirely new seed obtained from another source. In accordance with the report of Sir John Russell and Dr. Martin Leake there has been a re-organisation of the agricultural research work in the Sudan. A considerable increase in the capital of the Syndicate is foreshadowed.

Straits Settlements.

The Straits Settlements, comprising Singapore, Penang and Malacca, were transferred from the control of the Indian Government to that of the Secretary of State for the Colonies on the 1st April, 1867. The seat of Government is the town of Singapore. At the beginning of 1924 the price of standard rubber sheet was 49*c*. per lb., but in a weak market it fell steadily to 31½*c*. in May. Early in the Autumn the price began to rise until 68*c*. per lb. was reached in December. Estates have been maintained in good order and, generally, with considerable profit. A pleasing feature of the restriction of output is the economy of bark consumption. Areas of old trees, heavily tapped in the past have been rested and the incentive to tap young rubber has been removed, so that there are now, throughout all rubber areas in the Colony, excellent reserves of good tappable bark. Combined pressure from District and Agricultural Officers have effected improvement in the general maintenance of small holdings in Malacca and in Province Wellesley. A system of routine inspection has been inaugurated and is working successfully. The average price for copra during the year was $11.95 per picul (133⅓ lb.) compared with $11.30 per picul in 1923. The price of nuts varied from 4 to 6*c*. each, being sufficient to account for a prosperous year. Many of the palms in Penang and the Province are very old and bear very small crops. Attention is being given, with success, to the planting of supplies. In Malacca the crop harvested for the season 1923-24 was satisfactory, while the crop 1924-25 promises well. Vigorous encouragement by the District Officer, Balik Pulau, with the co-operation of Agricultural Officers, has brought about a revival of interest in cloves and nutmegs which at one time provided valuable exports from Penang and Province Wellesley. As an encouragement the assessment on rubber land partly planted with cloves and nutmegs has been reduced and already a great deal of unproductive and poorly cultivated rubber has been cut out to make room for the planting of spices. The plot of Egyptian Cotton planted in Malacca in 1923 failed completely. Six small trial plots were planted in different parts of Province Wellesley towards the end of 1924 with a strain of Egyptian cotton. The plants grew fairly well but considerable damage was done by a leaf-roller (*Sylepta derogata*).

The Gold Coast.

Sir Gordon Guggisberg, K.C.M.G., D.S.O., Governor of the Gold Coast was recently entertained by the African Trade Section of the Liverpool Chamber of Commerce on the occasion of his departure to the Colony from England. Mr. Robert L. Holt, Chairman, paid tribute to the many successes achieved by Sir Gordon during his tenure of office under the Colonial Office. Rapid progress was being made in all directions, particularly in connection with transport, harbour facilities and education. He emphasized that future events would prove the wisdom of the Government in providing a deep-water harbour at Takoradi. It should certainly minimise the enormous losses which are taking place to-day through pillerages and losses of cargo, demurrage to ships, and the considerable expense attached to the lighterage organisations which at present exist. Sir Gordon Guggisberg, in responding, said that the visit of His Royal Highness the Prince of Wales to the Gold Coast Colony had been absolutely wonderful, and it had created the good feeling that had been gradually arising between the Government and the natives of the country. Next January the Under-Secretary of State for the Colonies, Mr. Ormsby-Gore, was going to West Africa. The cocoa production of the Colony had gone on increasing each year. There has also been a distinct revival last year in the production of palm oil products but he had not very much hope for it unless they could adopt the new system of cultivation. The *African World* reports that with the raising of the Imperial Treasury's embargo on loans, the Gold Coast will float a loan for £4,628,000 4½ per cent. at £94 per cent. the funds being needed for the construction of the Tokoradi Harbour, the Central Province Railway and other railways and harbours in the Colony.

West Indies.

Notes submitted each month by the Agricultural Officers-in-Charge of the Botanic Gardens and Experiment Stations in the several islands of the Windward and Leeward Islands groups of the British West Indies, under the title of "Items of Departmental Interest," have for several years past served a very useful purpose in helping the staff of the Imperial Department of Agriculture to keep in touch with the progress of Agricultural Work in these islands.

THE following notes are taken from recent numbers of these Items:

Cotton.—During October, the reaping of the cotton crop of St. Kitts was completed and most of the fields cleared of the cotton plants and fallen bolls. The crop has been a good one, with heavy yields recorded on some estates, and an average yield for the island of about 150 lb. lint is estimated.

In Montserrat, the cotton was being picked, the estates in the Leeward District having mostly finished and started the clearing up of the fields; in other districts wet weather was interfering to some extent with the proper getting of the crop. The close season for Montserrat was likely to be fixed from December 15th, to March 1st.

The cotton crop of Nevis has been a very poor one, on account of the persistent dry weather. The fields are being cleaned up satisfactorily and there seems to be a prospect for some increase in the area planted in cotton for the next season.

The pink boll worm has been present and generally prevalent throughout these islands, but the early planted cotton which was favoured with reasonably good growing weather made a first picking free from serious injury. The second crop was severely attacked and late planted cotton and that stunted by dry weather conditions suffered badly.

Sugar.—The sugar crop in St. Kitts and Antigua for the past season was a good one. In the former island the output was 15,500 tons with an average yield of about 20 tons per acre of sugar-cane for the island. For Antigua the crop amounted to 14,600 tons of sugar.

With the continuation of favourable weather is reported that there is a good prospect for a crop in St. Kitts in the coming season, equal to that of the season just past.

In St. Lucia, also, the prospects for a good sugar crop in the 1926 season are indicated. It is felt that the use of Nitrate of Soda instead of Sulphate of Ammonia has been a decided benefit to the growing sugar-cane.

Fruit.—The planting of bananas is being continued in St. Lucia, and plants of Mango, Avocado Pear and other fruit trees are in good demand from the nurseries in several of the islands.

Limes.—The Lime Experiment Station, Dominica, reports a good first crop of limes and good prospects for the second crop. A good crop is also reported in St. Lucia, where the Government Lime Juice Factory received and dealt with 416 barrels of limes and 667 gallons of lime juice for Peasant proprietors, and 2,807 gallons of juice for Estates.

The withertip disease of limes has now been reported as occurring in St. Kitts.

Tobacco.—Interest in Tobacco cultivation was being maintained in Montserrat, where 8,000 lb. cured tobacco was ready for shipment to the United Kingdom, and nurseries were being planted for the coming season's crop, and in Dominica where a Tobacco Growers Co-operative Association has been formed.

British Guiana.

The annual colonial report for British Guiana during the year 1924 (No. 1270) records that trade during the year was generally satisfactory, most of the principal crops showing an increase in volume although in some cases, most notably in sugar, unfortunately accompanied by a considerable fall in value. The quantity of rum exported was doubled, and there were also large increases in the shipments of molasses, rice, lumber, timber, railway sleepers, copra and balata. Trade within the Empire has continued to improve at the expense of foreign countries, including the United States of America, the imports from which place have been halved since pre-war days. Notwithstanding a decline in the average under canes from 57,814 areas in 1923 to 57,190 areas in 1924, coupled with a severe drought in the early part of the year, the production of sugar amounted to 91,782 tons of sugar compared with 90,758 in the previous year. The prices obtained for sugar, however, barely exceeded the cost of production in many cases. The out-put of rice increased from 19,000 tons in 1923 to 25,058 tons in 1924 in spite of a decrease in acreage from 34,965 to 29,406 acres. During the year a notably step was taken in the appointment of Mr. J. B. Cassels, M.B.E., as Trade Commissioner for British Guiana, with offices at Abbey House, 94, Tothill Street, Westminster. Excellent work has already been accomplished. The second Colonization Mission, which visited India during 1923-24, was afforded an opportunity of discussing the British Guiana Colonization Scheme of 1920 with the special Committee on Emigration of the two Houses of the Indian Legislature. The Committee has reported favourably on the scheme, but has suggested to the Government of India that a delegate should visit the Colony to enquire into certain matters affecting the political and economic status of Indians in the Colony, and to go into the arrangements to be made for prospective settlers. (This delegate has already visited British Guiana.) During the year the birth rate amounted to 23·4 per 1,000 of the population, and the death rate 25·6 per 1,000. The birth rate among Europeans, other than Portuguese, amounted to only 14·1 per 1,000 but on the other hand the death rate is only 13·1 per 1,000. Infantile mortality is still very heavy, the rate being 165 per 1,000 births.

THE ISOELECTRIC THEORY.

Its Application to Certain Problems of Crop Products Manufacture, and Soil Fertility.

[*This article forms the Sixth and last part of a series of articles that have appeared in previous successive issues of this Journal. The first five parts were by Professor Hardy, and described (I) the general idea of the Isoelectric Theory and its bearing on precipitation of hydrophilic colloids by electrolytes; (II) the application of the theory to the coagulation of rubber latex; (III) its application to defecation processes in cane sugar manufacture; and (IV) its application to cacao fermentation. Part V dealt with the mechanism of flocculation in colloidal soils by certain soil ameliorants. The present section (Part VI) is by Mr. Turner, who discusses in it exchange reactions in soils.*]

PART VI.

BY P. E. TURNER, B.SC., A.I.C.

II.—APPLICATION OF THE ISOELECTRIC THEORY.—*Continued.*

(*b*) Reactions in Colloidal Soils.—*Continued.*

2.—Soil Fertility and the Effects of Fertilisers.

IN a previous article (*Tropical Agriculture*, Vol. II, No. 12) it has been pointed out that lateritic soils differ from temperate soils in that the former are more highly weathered. The alumino silicates present in the soils of temperate zones, have, in lateritic clays, been more or less decomposed, according to the intensity of the weathering, into hydrous alumina and hydrous silica, the latter tending to be leached away in the process. The hydrophilic coatings of the ultimate particles of lateritic soils will therefore consist, at least in part, of hydrous alumina.

Hydrous Alumina.

Hydrous alumina is an ampholyte, the isoelectric point of which lies at pH 6·5. In media of a greater pH value, the alumina acts as an acid, giving rise to electro-negative, acidic, *aluminate* ions. In those of lower pH value, on the other hand, the alumina gives rise to electro-positive, basic, *aluminium* ions, acting in this case as a base. As the pH values of both these media approach more nearly to 6·5, the systems become more and more unstable. The instability becomes so marked that precipitation of the ions, as hydrous alumina, occurs somewhat before this value is reached. Hydrous alumina is therefore precipitated from solution within an "isoelectric zone," which lies around the pH value 6·5.

The mode of behaviour of the hydrous alumina in the hydrophilic coating of lateritic clays depends therefore on the pH value of the soil. If the pH value of the soil lies within its isoelectric zone the hydrous alumina is insoluble and the soil well flocculated. If the soil is alkaline to its isoelectric zone the hydrous alumina will give rise to acidic aluminate ions; if acidic to this zone, basic aluminium ions will tend to be formed. The manner in which the alumina ionises markedly effects the properties of the soil. Lateritic clays, may, in fact, be divided into two classes, according to the type of ionisation which take place.

Base Adsorption in Soils.

Lateritic soils giving rise to acidic aluminate ions will be considered first. With these may be classed all productive temperate soils, which, as has been pointed out in a previous article, give rise to negative alumino-silicate and silicate ions.

These negative ions, whether aluminate, alumino-silicate, or silicate ions, are too bulky to diffuse away from the clay particles. They remain in the water sheaths surrounding them. Being negatively charged they attract to themselves, and combine with more or less loosely, positively charged ions from the soil solution. That is to say, they *adsorb* positive ions from the soil solution. These positive ions may be hydrogen, sodium, potassium, ammonium, calcium or magnesium ions. The amount and relative proportions of the ions which are adsorbed depend on the extent to which each occurs in the soil solution, and the affinity of the adsorbing negative ions for each particular positive ion.

The adsorbed positive ions exert an overwhelming influence on the fertility and tilth of the soil ([1]). Each ion confers on the soil a particular set of properties. An excess of adsorbed hydrogen ions for example leads to soil acidity. Sodium ions form with the negative adsorbing ions "adsorbates" which pass readily into colloidal solution. A high percentage of sodium "adsorbates" leads to the formation of an excessively alkaline soil, which is heavy and viscous, drains badly, dries slowly, and allows of poor aeration. The "adsorbates" which calcium ions form, are, on the other hand, practically insoluble. If predominant they give to the soil a crumbly, porous texture, which allows rapid draining and good aeration.

The Effect of Fertilisers. Base Exchange.

Any alteration in the proportion of the ions present in the soil solution leads to an adjustment in the proportion of the ions adsorbed. Such alterations result from the application of fertilisers. Suppose, for example, nitrate of soda is added to the soil. This leads to an increase in the quantity of sodium ions in the soil solution. Some of these additional sodium ions will replace a part of the calcium, magnesium, potassium, ammonium and hydrogen ions already adsorbed. The displaced ions pass back into the soil solution. The replacing ions are adsorbed in their stead. An exchange of this type always takes place in stoichiometric proportions, that is, the quantity of ions displaced is equivalent to the amount

of those replacing them. One of the results of the application of sodium salts to the soil, therefore, is an increase in the quantity of sodium ions adsorbed. A slight deterioration of tilth will result. It is not suggested that a few applications of nitrate of soda are necessarily harmful. The deterioration is negligible when the number of applications is restricted. Only when applications are made year after year do the ill effects become serious, as the Rothamsted Experiments show ([2]).

The addition of calcic fertilisers, leads to an increase of calcium ions in the soil solution. Part of the ions thus added will stoichiometrically replace some of the ions already adsorbed. Replacement of sodium ions by calcium ions leads to the replacement of a soluble sodium "adsorbate" by an insoluble calcium "adsorbate," resulting in an improvement of soil texture.

The replacement of hydrogen ions by Ca ions results in decreased acidity. The effect of the addition of any fertiliser, in fact, can be determined by considering the nature of the "adsorbate" it will tend to form. Healthy, fertile soils, contain at least ten times as many adsorbed calcium ions as sodium and potassium ions. Such fertilisers should always be applied as will tend to bring about this ratio. Before any extensive applications of manures are made, each soil type should be examined to determine the amount and relative proportion of the adsorbed bases. Fertilisers can then be chosen which will help to bring about an adjustment of the amounts of adsorbed bases to that required for healthy soils.

Reference may be made at this point to humus, which can form part of the hydrophilic coatings of clay particles. Humus gives rise to acidic "humate" ions, which can adsorb positive ions just as the other negative ions mentioned. The properties of the humates are very similar to those of the corresponding "adsorbates." Sodium humates for example pass into colloidal solution readily, adversely affecting soil tilth. The replacement of sodium by calcium leads to the formation of an insoluble calcium humate with consequent improvement of tilth.

Acid Adsorption by Soils.

In lateritic soils of pH less than 6·5 the state of affairs is probably somewhat different. The hydrous alumina coating the clay particles is in a medium on the acid side of its isoelectric zone and will give rise to basic aluminium ions. If the hydrous alumina is present in sufficient extent to dominate the system, sufficient aluminium ions will be present in the water sheath to convert the clay particles into bulky colloidal positive ions. In this case the ions attracted from the soil solution, and adsorbed, will be negative ions, for example, nitrate, chloride, sulphate, silicate and phosphate ions. These acidic ions should be capable of stoichiometric replacement by other acidic ions, just as adsorbed bases can be replaced by other basic ions.

It might be expected that soils in which acid adsorption is predominant would have difficulty in fixing bases. This is found to be the case in certain Hawaiian soils, which are known to retain potash, for example, poorly ([3]). These soils are lateritic clays, and are mostly on the acid side of the pH value 6·5. They are believed to consist largely of hydrous alumina, and very possibly fall into the second class. Again, these acid soils have been shown to give little or no response to lime ([4]). Lime is an ideal corrective agent for base adsorbing soils with a low pH value because it tends to replace adsorbed hydrogen ions. It cannot cause replacement of adsorbed acid radicals, hence, perhaps its failure on the Hawaiian soils.

On the other hand these soils have a high fixing power for phosphates, a property easily explained if aluminium ions are present in the water sheaths surrounding the clay particles. Phosphate ions would in this case be very strongly adsorbed, few being left free in the soil solution. It is interesting to note in this respect that the phosphate requirement of Hawaiian soils is fairly reliably indicated by the solubility of the soil phosphates in citric acid. This method of estimating phosphate availability does not always give satisfactory results with temperate alumino-siliceous and siliceous soils. It may be, that in the Hawaiian soils the adsorbed, negative phosphate ion is stoichiometrically replaced by the negative citrate ion giving more precise, reliable, and constant results than in those soils in which base adsorption, not acid adsorption is predominant. It has been found, also, that the available phosphate in these soils increases with the amount of soluble silicate present. It is possible that the silicate ions tend to replace the adsorbed phosphate ions thus rendering them more readily assimilable by plants.

The same soils in Hawaii are found, too, to be able to stand much higher fertilising with nitrate of soda (giving very high yields of sugar-cane) than younger tropical soils. This may be due to the adsorption of the acidic nitrate ions in the former case (although they would be held much less loosely than the phosphate ions), by the positive aluminium ions. In the younger, base adsorbing soils, the sodium ion would be adsorbed in preference. To supply the nitrogenous requirements of the latter soil it might be better to use ammonium salts rather than nitrates. The ammonium ion, being a basic ion, would then be fixed.

The examples quoted show the necessity of the examination of all soils, especially lateritic soils, from the standpoint of their physico-chemical properties discussed in these articles. The work done on the exchange of bases in base adsorbing soils has thrown much light on their fertiliser requirements. Unfortunately little is known as yet about the acid adsorbing soils and acidic exchange. In fact it is only just beginning to be realised that their fertilising

problems are different from those of the former. It is hoped that the work in progress on lateritic soils in the Chemical Laboratories of the College will help to solve many of the problems connected with them.

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(3) McGeorge "Absorption of Fertiliser Salts by Hawaiian Soils." *Hawaii Agric. Expt. Station* Bull. No. 35, 1914.

(4) McGeorge "The Influence of Aluminium, Manganese and Iron Salts upon the Growth of Sugar-Cane, and their Relation to the Infertility of Acid Island Soils." *Hawaiian Sugar Planters' Association.* Bull. 49, 1925.

NEW YORK COCOA EXCHANGE.

SINCE our November issue further details have come to hand of the organisation of the New York Cocoa Exchange. Futures contracts consisting of a minimum of 30,000 lb. net of cocoa beans can be entered into for the Standard Grade which is defined as "cocoa while otherwise sound, defective to the extent of eight per centum by count, and slatey to the extent of ten per centum by count. Under these contracts the following Standard Growths may be tendered:—"Accra Kinds (product of British Gold Coast Colony) of the main crop, Bahia (product of Brazil) San Thomé, Fine (product of the Portuguese Island of San Thomé). The following additions to or deductions from the contract price shall apply for variations in grade from the Standard Grade. For each one-half per centum defective less than eight per centum an addition of 1½ cents per 100 lb. For each one-half per centum, inclusive, a deduction of 1½ cents per 100 lb.; for each one-half per centum defective more than twelve per centum, a deduction of 2½ cents per 100 lb. No delivery may be made of cocoa more than fifteen per centum defective. No delivery may be made of cocoa, the sale of which is restricted on account of quality by the United States Government or any State or Municipal authority. For each one per centum slatey more than ten per centum a deduction of one, on which no deduction shall be made for excessive slate."

It is also provided that the following additions and deductions for variations in grade, shall apply on deliveries of cocoa beans listed in the groups below:

GROUP A. Addition of one-quarter cent (¼*c.*) per lb.

Ceylon, not below Native No. 1 (the product of Ceylon), Grenada Estates (the product of Grenada), Guayaquils (the product of Ecuador), Java, not below No. 3 (the product of Java), New Hebrides, Light Break Fine (the product of New Hebrides Is.) Samoan, Light Break Fine (the product of Island of Samoa), Trinidad (the product of Trinidad), Venezuelans (the product of Venezuela).

GROUP B. Deduction of one-eighth cent (⅛*c.*) per lb.

Cameroon, Fine (the product of Cameroon, Africa), Costa Rican, Fermented (the product of Costa Rica), Grenada, Ordinary (the product of Grenada), Jamaica, Fermented (the product of Jamaica), Panama, Fermented (the product of Panama, Para Up-River (the product of Brazil) Surinam Estates (the product of Surinam).

GROUP C. Deduction of three-eighths cent (⅜*c.*) per lb.

Accra Kinds (the product of British Gold Coast Colony of the middle crop).

GROUP D. Deduction of one-half cent (½*c.*) per lb.

Sanchez (the product of Santo Domingo), Costa Rican, Ordinary (the product of Costa Rica), Lagos Kinds (the product of Nigeria) of the main crop, Panama Ordinary (the product of Panama), Para Down-River (the product of Brazil), Surinam, Ordinary (the product of Surinam).

GROUP E. Deduction of three-quarter cent (¾*c.*) per lb.

Jamaica, Ordinary (the product of Jamaica), Lagos Kinds (the product of Nigeria) of the middle crop.

GROUP F. Deduction of one cent (1*c.*) per lb.

ALL OTHER GROWTHS.

It will be noted that the premium for superior types of cocoa has been fixed at such a low rate that it is hardly conceivable that any of these growths will ever be tendered in fulfilment of a futures contract. The growths in Group A will command a premium of 25*c.* per 100 lb. over the Standard Exchange Growths, plus the addition warranted by absence of defective beans. Provided the higher grades tendered do not contain any defective beans, that addition would amount to 1½*c* per 100 lb. for each ½ per cent. defective less than 8 per cent., or 24*c.* per 100 lb., making in all a total premium of 49*c.* per 100 lb., or roughly ½*c.* per lb. over Standard Growths. When the higher grade crops come on the market during the first half of the year the premium for Trinidad cacao over Standard Growths usually narrows to 1½*c.* to 3*c.* per lb. compared with 4*c.* to 7*c.* per lb. towards the Autumn. Since the premium for the better growths has never sunk to such a low premium as 25*c.* or even 49*c.* per 100 lb. one wonders for what reason they were specifically included.

The College has been able to muster a Rugby Team for the first time. A game was played against Trinidad Rugby Football Club on December 3rd. The game was very fast and College, by a series of rushes, had the score 8-3 in their favour by half time; in the second half the pace told and College were on the defensive the whole time. Eventually Trinidad won 12-8, Haig and Kenchington scoring for College. The following played:—Messrs. Storey, Waterfield, De Villiers, Mowl, Skinner, Haigh, McDonald, Bulwer, Van Rooyen, Kenchington, Guest, Liebenberg, Davies, Taurel and Taurel.

SWAZILAND.

Progress during 1924.

THE principal crops grown in Swaziland are maize, kafir corn, tobacco, cotton and beans. During 1924 (Annual Colonial Report No. 1261) the maize crop was above the average. A very good class of maize is grown, chiefly the "Hickory King" dent variety. The average price was 21*s*. a bag of 200 lb. Growers in the bush veld are trying white flint varieties owing to the fact that these varieties require a shorter growing season. Crops of dent varieties often fail in the low country owing to insufficient rain at the beginning of the season. The crops of kafir corn and tobacco were both up to the average, the returns showing that 278,500 lb. of tobacco were grown. The cotton crop was increased considerably and at the end of the year approximately 8,000 acres were under this crop. The amount handled in Durban on behalf of Swaziland was approximately 100,000 lb. lint, the average price realised being 15*d*. per lb. Mr. Milligan, who was deputed by the British Empire Cotton Growing Corporation to report on the prospects of South Africa as a cotton growing country, visited Swaziland in July and is said to have been much impressed. The principal varieties of cotton grown are "Griffin," "Watts Long Staple," "Improved Bancroft," and "Zululand Hybrid." The main crop is "Griffin," the original seed having been imported by the Government in 1921. "Improved Bancroft" is also very largely grown as it appears more resistant to attacks of the Jassid insect on account of the hairy condition of the leaves. Of the crop 83 per cent. was of a grade $1\frac{1}{8}$ inches and over. Many swarms of flying locusts invaded the country from the Union but fortunately hatchings were reported in two parts only and these were soon destroyed. Poison and spray pumps are distributed throughout the Territory for dealing with young locusts. The Government horticulturist of the Transvaal reported very favourably on the prospects of fruit growing, and he was particularly impressed with the suitability of the climate and soil for citrus fruits and mangoes. The country is well watered by numerous large rivers which constitute an extremely valuable asset for the development of power and for the purposes of irrigation. Development is retarded by the absence of railways and good roads. Swaziland, especially in the bush veld, is one of the finest cattle raising centres in South Africa and it is reported that before the invasion of rinderpest in 1894, the country teemed with cattle. By 1911 rinderpest and East Coast fever had reduced the number of cattle to 57,601 head. The introduction of pure-bred bulls of the principal breeds is rapidly improving the class of cattle in the Territory.

The *West India Committee Circular* reports that witch-broom disease of cacao has been raging so furiously in Ecuador, that in whole districts it has been found necessary to cut down the trees.

GRADING OF COCOA.

Movement in Trinidad.

ON page 7 of this issue we refer to the appointment of a special Sub-Committee of experts in Trinidad to formulate proposals for the grading and marketing of Trinidad Cocoa. Below we publish the report of the Sub-Committee which constitutes the outline of the scheme which it is suggested should be adopted.

Your Sub-Committee appointed on November 25th, have met and considered its Reference, *i.e.*: (*a*) the grading and marketing of Cocoa, and (*b*) the ways and means of giving effect thereto, and now beg to recommend as follows:—

(*a*) GRADING AND MARKETING OF COCOA: To simplify the grading of Cocoa the principle of having two main classes (fermented and unfermented) should be established. When combined with the separation of all waste matter on the Estates, inspection will be brought down to a minimum. The grades could then be defined as follows:—

1. *Fermented:*
   (*a*) No. 1 Grade, or "*Superior Plantation*," *i.e.*: uniform beans only, regular fermentation, all waste and wings eliminated.
   (*b*) No. 2 Grade, or "*Plantation*," *i.e.*: fermentation as regular as possible, and clean.

2. *Unfermented:*
   No. 3 Grade, or "*Ordinary*," which shall be cleaned.

In our opinion there should be a No. 4 Grade or ungraded which shall consist of Cocoa that does not meet the requirements of the foregoing three grades.

(*b*) THE WAYS AND MEANS OF GIVING EFFECT THERETO:

1.—Legislation to appoint Body to work scheme;

2.—For working expenses Government to be asked to authorise the collection of a small fee per Bag for a Certificate issued by Inspectors stating that Cocoa meets the requirements of the above Marks;

3.—(*a*) Body appointed to have power to license premises as grading stations, and produce to be shipped from licensed grading stations only;
(*b*) Body should provide warehouses for inspection of Cocoa in cases where premises are not licensed;
(*c*) Body to have power to stop license of premises in cases of infringement of their rules and regulations;
(*d*) Customs to have power to stop shipment of Cocoa without the appropriate certificate.

REVIEWS.

THE TENURE OF AGRICULTURAL LAND by C. S. ORWIN, M.A., and W. R. PEEL, M.A., D.S.O., Cambridge University Press, pp. VIII + 76. 3*s*. 6*d*.

A system of Land Tenure is the practical issue which arises from the essential need of defining the relation between the population and the land. It is found in one form or another wherever a population exists, and even in those countries in which population is of the sparsest, it will be found in some elementary shape. The phenomenon is thus universal and, requires to be studied in all its manifestations if that grip of the subject is to be obtained which will enable the particular problem to be solved with judgment. It is because of this fundamental similarity that this book, though it deals solely with the present day aspect of English agriculture, must appeal to students of Land Tenure even when they are mainly concerned with the different conditions of tenure within the Tropics.

England has been a landlord's country; the state is entirely divorced from the land except when, as in the case of Crown lands, it assumes the function of landlord. The whole rural system has been built up and has hitherto rotated round this central fact. Any incremental values that accrued during the course of centuries, whether the result of improvements or of any change in money value, pass in consequence to the landlord and tenant, the relative share between the two being adjusted in the rent. The State received no regular part of such increment though, owing to the rise in administration costs, such taxes as death duties which have in recent years been imposed, do form such a drain on estates, but a drain which is less satisfactory, because irregular in incidence.

This system has broken down; the landlord is a disappearing element from rural life and tenants are being forced to purchase to retain security though all evidence points to the absence of desire to purchase. Lack of capital for intensive development and lack of marketing facilities characterise the change and it is evident something must be done to rescue British Agriculture from the slough into which it has drifted. The authors propose a system of state purchase as distinct from nationalisation and elaborate the system in some detail with a very fair statement of the pros and cons, though doubts may be entertained as to the advisability or effectiveness of a further host of officials.

The main interest from the general aspect, however, lies in the reasons for the practical difficulties. Since the State has no recognised status in relation to the land, private vested interests to the full incremental value have accumulated and the buying out of those interests constitutes the major practical difficulty in reform. In most tropical countries, especially in those hinterlands only now being opened up, a certain and, perhaps nebulous state ownership already exists; land is abundant and has an assured incremental value in the future. The question arises whether the state is wise to give up those potential sources of revenue in view of the inevitable increase of expenditure in the future. In those island and coastal areas in which, owing to early occupation, development has already progressed, the English system has already taken root but here also may it not be advisable to call a halt? At any rate the subject is worthy of study. The volume under review indicates clearly the dangers of a policy in which the State is entirely divorced from the land, and will well repay study from this aspect alone.

"RUBBER PRODUCTION IN THE AMAZON VALLEY."—Prepared by the United States Department of Commerce. pp. 369, with two maps and many illustrations, paper covers. Copies, price 65*c*., can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., and from branch offices of the Bureau of Foreign and Domestic Commerce in eighteen other cities.

The above publication is the fourth of the series of reports prepared under instructions from Congress "to investigate and report on the possibilities of developing the rubber-plantation industry in the Philippine Islands and Latin America." The Amazon Valley was at one time responsible for the production of all the raw rubber consumed in the rubber manufacturing industry of the world, but the rapid rise of the plantation industry in the East rendered the collection of rubber from wild sources unprofitable, with the result that the Amazon Valley became an insignificant factor in the world's rubber market. The recent rapid rise in the price of raw rubber has again stimulated interest in these self-sown sources of supply. It is feared in some countries, particularly in the United States, that in a few years time there will be insufficient rubber to meet the increasing demands of the manufacturing industry, except at excessively high prices. The report under review discusses the present position of the wild rubber industry of the Amazon Valley in relation to the various physical, political and economic factors affecting the possibility of establishing rubber plantations in that area. It has been determined that suitable conditions exist in many localities and over large and contiguous areas of country both in the regions easily accessible from the mouth of the river and in other regions at present devoid of adequate transportation facilities. Ocean-going vessels can ascend the Amazon beyond Iquitos, Peru, and the Tapajoz, Madeira and Purus for considerable distances from their junctions with the main stream. Areas near these rivers can be penetrated all the year round by river boats of fairly large capacity. Other regions, such as the Acre Territory in Brazil and neighbouring areas in Bolivia are at a disadvantage because of their greater distance from points reached by ocean-going vessels, and also because of the decreased navigability

of their rivers during the dry season. Development of still more remote regions in Eastern Peru, South-eastern Colombia, and Eastern Ecuador will depend upon the provision of railway facilities to the Pacific Ocean.

The difficulty of securing an adequate labour supply is likely to prove an important limiting factor on the development of the industry. The population of the area under review, which comprises approximately 2,250,000 square miles, is estimated at 1,500,000. It is suggested that 30,000 labourers might be secured in the Amazon Valley for rubber-planting projects, sufficient, in the estimation of the investigators, to plant and care for an area of at least 150,000 acres. When the report was prepared the average daily wage of the labourer was 2-3 milreis (25c. to 35c.) in the lower Amazon, but in the upper Amazon rates of pay were higher. Since then the production of rubber in the Amazon Valley has been stimulated by the rise in the price of rubber and this has doubtless affected the daily rates of pay. The labourer of the Amazon Valley is of good physique and capable of sustained effort, granted an adequate incentive. Land is available in large tracts at nominal prices in most areas and the various governments have intimated their willingness to reduce the existing heavy export taxes in order to encourage the development of the industry.

C. Y. SHEPHARD.

"MEMORIALS OF ALFRED MARSHALL."—Edited by Prof. A. C. Pigou, M.A., London: Macmillan & Co., Ltd. pp. ix+518 with 7 portraits. Price 12*s*. 6*d*. net.

Of the economists who knew Alfred Marshall only by his published works—and they are many—few can appreciate the elevated position assigned to him by his English contemporaries and successors. Although excessively shy of committing his work to the press he unreservedly communicated his ideas to friends and students and Royal Commissions. Moreover, his deliberately unsensational style and his consistent method of attributing to earlier economists what they meant to say, and not necessarily what they said, made his publications appear a clear and easy exposition of fairly obvious facts. As a result his books reached an extraordinarily wide circle of readers, but it is only those who study his works with the advantage of an elaborate training in the "dismal science" and a strong independence of thought, who can appreciate the vast mass of knowledge concealed behind his highly polished style. The present volume contains, in addition to appreciations by prominent economists who were once his pupils, valuable selections from his writings, and a large number of letters written to economists in various parts of the world. These enable us in some small measure to appreciate the valuable contribution of Alfred Marshall to the science of economics. There exists no serious student of economics who can afford to be without this book.

C. Y. SHEPHARD.

COLLEGE NEWS.

The Parliamentary Delegation is due in Trinidad on January 12th, 1926, and according to present plans, will visit the College on the afternoon of January 13th.

According to the usual custom a party of Post-Graduate Students will visit St. Vincent during the Christmas vacation to study the cotton cultivation of that island.

On November 17th, 1925, Sir H. A. Byatt, K.C.M.G., Governor of Trinidad and Tobago, visited the College in company with Sir C. H. Rodwell, K.C.M.G., Governor-elect of British Guiana.

A party of students with Professor Dash visited Caroni on November 14th, and through the courtesy of Mr. L. Grant, Manager, were conducted over certain of the estate fields with a view to observing large scale methods of sugar-cane cultivation in that region.

Mr. E. A. Seagar, M.B., Ch.B., arrived in Trinidad on November 30th, 1925, after a prolonged tour in the United States, Jamaica and Panama where he has been studying the latest methods adopted in combating Tropical Disease used by the officers of the International Health Board.

The College Association Football XI played Casuals during November and lost by 2-0. On December 7th, they met Shamrock and won by 4-2. The following represented the College on this occasion:—Messrs. L. A. Blanc, B. G. Owen, V. J. Mulloon, A. McDonald, G. S. Skinner, J. Waterfield, R. M. Steven, J. Potter, R. Follet-Smith, J. V. Lochrie, and J. E. James. Mr. R. Follet-Smith scored the four goals.

During the season the following have played for the Rest against Trinidad Born on several occasions: Messrs. De Villiers, McDonald, Bulwer, Van Rooyen, Kenchington and Guest.

The Cricket Team has played the following matches during the present term. The first match was against an Eleven representing Orange Grove, but unfortunately rain interfered with the match which was in consequence drawn.

The Team met Stanmore C.C. on the College grounds on November 22nd and scored 69 runs against the latter's score of 102, thus losing by 33 runs. Only two batsmen succeeded in making double figures, they were F. Bain and H. Huggins whose score was 27 and 12 respectively. Bain took 4 wickets for 21 runs, Birkett 4 for 28, Springer and Palmer 1 wicket each for 21 and 18 respectively.

A match was also played against Northern Oriental C.C. The College team scored 105 against the visitors' score of 50, thus winning by 55 runs. The principal scores were:—Birkett 66 runs and Archer 23 runs. Archer took 3 wickets for 6 runs, Springer 3 for 11, Bain 2 for 3, Birkett and Palmer 1 wicket each for 17 and 5 runs respectively.

It is interesting to note that Bain and Birkett are at present practising at the Queen's Park Oval in connection with the coming M.C.C. Tour.

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—Prices again showed a slight decline during October with a tendency to harden during the third week of November. On November 18th prices included 31*s.* 4½*d.* per cwt. for Cubes, 27*s.* 7½*d.* for Best Granulated, 25*s.* 1½*d.* for West Indian Crystallized, and 21*s.* 4½*d.* for Muscovado.

COTTON.—Prices declined, during the past month, to nearly 10*d.* per lb. for mid-American. On November 19th, 10·74*d.* per lb. was realised. Prices fluctuated within comparatively narrow limits in view of the proximity of the next Bureau report. Much discontent is said to exist with the alleged misleading reports of the Bureau. Many forward contracts were entered into on the basis of 13*d.* but the large crop now anticipated has reduced prices to the neighbourhood of 10*d.* It is reported that this year's crop will contain a large percentage of low grade cotton. The consumption of cotton in America is expected to be largely in excess of last year, various authorities estimating the increase at between 400,000 and 600,000 bales on last year's consumption of 6,192,000 bales.

COCOA.—The superior grades of cocoa have remained practically unchanged in price, remaining at 107*s.* 6*d.* for Ceylon Ordinary, 77*s.* 6*d.* for Trinidad Middling Red, and 67*s.* 9*d.* for Grenada Fine, on November 18th. Accras on the other hand, have been very dull and have declined from 47*s.* 6*d.* per cwt., on October 21st to 40*s.* on November 18th.

COFFEE.—Prices for coffee have declined considerably but this is due, in the main, to the increased arrivals. The better qualities are in good demand. Costa Rica Middling declined from 174*s.* per cwt. on October 14th to 160*s.* on November 11th at which figure it has remained steady up to November 18th, East Indian Mysore Middling declined, during the corresponding period, from 140*s.* to 132*s.*, Kenya Good Middling from 130*s.* to 124*s.* and Brazil Santos from 100*s.* to 96*s.* The latter prices are barely being maintained.

TEA.—Tea is decidedly dearer. Between October 14th and November 18th average prices. advanced from 21·21*d.* per lb. to 22·20*d.* for Ceylon, from 16·54*d.* to 19·05*d.* for Indian, and from 13·44*d.* to 14·52*d.* for Java. Java tea experienced rather wide fluctuations during the month, dropping to 12*d.* per lb. on November 11th, but recovering rapidly during the following week. Stocks in bond amount to 181,683,000 lb. Exports increased from 63,470,198 lb. during the corresponding period of 1924 to 68,855,978 lb. this year.

SISAL AND HEMP.—Sisal declined from £45 to £44 10*s.* per ton, but at the latter price remains very steady. Buyers refuse to pay more than £41 per ton for Manila Hemp.

ENGLISH BEET SUGAR.

AN important step in the development of the British beet sugar industry was taken at Ely recently, when Mr. Edward Wood, the Minister of Agriculture, opened the new factory of the Ely Beet Sugar Factory, Limited. The Ely factory is the first of the six new factories which were promised in connexion with the passing of the British Sugar Subsidy Act, 1925. The Anglo-Dutch group, of which the present Ely company forms a part, took upon itself the responsibility for the erection of three out of the six factories. Situated on the banks of the Ouse, in the centre of a fertile agricultural district, the Ely factory, which has taken only about 12 months to build, is well served by road, railway, and water. It is about a mile and a half from Ely Station, and is at the junction of a number of railway lines. The total area of the factory site is 66 acres. For the reception of the water-borne beet and for other purposes a wharf has been constructed, 650 feet long. The company have their own fleet of 50 barges. The area covered by the factory buildings is 2¼ acres, and only the most up-to-date machinery has been installed.

Mr. E. Wood, in formally declaring the factory open, congratulated those responsible for what he termed "a very wonderful creation within the short space of 12 months." With the passing of the Subsidy Act they had been able to assure themselves of a real prospect of the secure and successful establishment of the new industry of sugar beet.

In 1925 they had an area under sugar beet of 55,000 acres. They had an estimated acreage for next year of something over 100,000 acres. He had always felt that a subsidy must be justified on exceptional grounds and must be able to show a reasonable certainty that it would effect its purpose. In this case, the State had the complete certainty that it would get an equivalent value in production for every pound of subsidy that it was called on to pay.

He hoped that both factories and growers would regard the subsidy period not as a period of an existence made tolerably comfortable by the dole of State support, but as a period of stern and unremitting preparation for the free competition which would follow it. Industries and factories and growers were essential to one another, but the growers were the linchpin of the whole chariot.

Owing to a dispute between employers and packers in some of the distributing firms, the publication of the December number of "*The Round Table*" is unavoidably postponed.